

The imprint of Southern Ocean circulation and biogeochemistry on the ocean's nitrate isotope distribution

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Many of the characteristics of the global mid-depth and upper ocean (~1300 m depth and shallower) are strongly influenced by the lateral input of waters from the subpolar latitudes of the Southern Ocean. The global distribution of nitrate isotopes (especially nitrate $^{15}\text{N}/^{14}\text{N}$, $\delta^{15}\text{N}$) is similarly impacted by the Southern Ocean. Nitrate $\delta^{15}\text{N}$ is elevated at mid-depths by the subduction of mid-depth waters with residual nitrate from partial assimilation in both the Antarctic and Subantarctic Zones. In the abyssal ocean, nitrate $\delta^{15}\text{N}$ is lowered slightly by the remineralization of the low- $\delta^{15}\text{N}$ sinking particles originating from that partial nitrate assimilation. Recent nitrate $\delta^{15}\text{N}$ and $\delta^{18}\text{O}$ ($^{18}\text{O}/^{16}\text{O}$) measurements from the GEOTRACES program and other sampling campaigns will be used to elaborate on the high and low latitude processes that generate, transmit, and preserve the Southern Ocean signal in the lower latitude ocean. In some cases, the nitrate isotope data yield new insights into these processes. The alteration and destruction of the Southern Ocean signal can also be used as an approach to quantify predominantly low latitude processes such as nitrogen fixation. Finally, glacial/interglacial changes in the Southern Ocean's imprint on the $\delta^{15}\text{N}$ of the nitrate supply to low latitude ecosystems will be considered.